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PRIMARY DATA STREAM COMMUNICATION

Inventor(s):

Jon N. Swanson

GREER, BURNS & CRAIN, LTD.
300 South Wacker Drive
Suite 2500
Chicago, Illinois 60606
Telephone: 312.360.0080
Facsimile: 312.360.9315
CUSTOMER NO. 24978

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PRIMARY DATA STREAM COMMUNICATION

CROSS REFERENCE

The present application claims priority under 35 U.S.C. §119 on US Provisional Application No. 60/472,648 filed on May 22, 2003.

FIELD OF THE INVENTION

The present invention is related to data communications, and to communication of a real-time data streams over a network as part of a virtual meeting.

BACKGROUND OF THE INVENTION

Many data applications involve communications of a plurality of data streams. Virtual meetings that include audio and video communications, by way of example, include communication of audio data streams, video data streams, and other data streams. Within this exemplary application, some conferences simultaneously link multiple attendee conference rooms that communicate data streams such as video, audio, applications, and the like. Each location may be communicating data streams from multiple cameras, microphones, and other sources to all of the other locations. The receiving location receives all of the streams from all of the other locations. In some virtual meetings the receiving attendee conference room may choose which received streams to display video and play audio from. Multiple streams may be displayed so that the receiving conference room can see and hear multiple of the other conference rooms.

When a large number of conference rooms are participating, and each generating a large number of data streams, the conference can become muddled and disorganized. For example, if ten attendees each have four cameras, then each attendee will receive thirty-six video streams. Displaying all of these streams, and further viewing them in a meaningful way, can be difficult and even impractical.

In a prior art meeting in one location with many attendees, one speaker at one location may moderate the meeting, and have other attendees request permission to speak. In this manner, only one speaker at a time presents, and all conference attendees can focus on that speaker. While this is known in prior art meetings and conferences where all attendees are present in a single location, coordinating this in a multi-conference room virtual meeting has proven difficult.

Unresolved problems in the art therefore remain.

SUMMARY OF THE INVENTION

The present invention is directed to methods for communicating at least one primary data stream. An exemplary method of the invention includes steps of communicating a plurality of real time data streams from each of a plurality of attendees connected to one another over a communications network to all others of the plurality of attendees, and communicating a primary selection command to at least a portion of the plurality of attendees. The primary selection command designates at least one of the plurality of real time data streams communicated from at least one of the plurality of attendees as a primary stream. The method further includes step of using the primary selection command to identify the primary data stream at the at least a portion of the plurality of attendees.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic of a network useful to illustrate an exemplary method of the invention;

FIG. 2 is a schematic of a conference room 12 of FIG. 1;

FIG. 3 is a flowchart illustrating one exemplary method of the invention; and,

FIG. 4 is an exemplary display template.

DETAILED DESCRIPTION

Embodiments of the present invention are directed to methods and computer program products for communicating at least one primary real time data stream between a plurality of attendees connected to one another by a communications network. Before describing an exemplary embodiment of the invention, it will be appreciated that program products of the invention may embody methods, and that methods of the invention may be practiced by a computer. A program product of the invention, for example, may be computer executable instructions stored on a computer readable memory that when executed cause one or more computers to perform steps of a method of the invention. Accordingly, it will be understood that description herein of a method embodiment of the invention may likewise apply to a computer program product, and likewise that description of a program product may apply to a method.

Exemplary methods and program products of the invention may find particular utility when practiced in association with a virtual meeting. As used herein, the term "virtual meeting" is intended to be broadly interpreted as an event in which real time communications occur between meeting attendees that are not physically present with one another. By way of particular example, a virtual meeting can be an audio/video conference conducted between attendees remote from one another over a digital data network. Also, as used herein the term "real-time" is intended to be broadly interpreted as meaning substantially instantaneous. For example, telephone communications over a

PSTN may be considered to be "real-time" based on the consideration that when a telephone user speaks his voice data is received at a far end of the PSTN at substantially the same time it is transmitted (although some small delay occurs). Finally, the term "attendee" is intended to broadly refer to a participant in the virtual meeting. Exemplary attendees may be one or more individuals using a data communications device linked to the virtual meeting, or may represent the linked data communications device itself.

FIG. 1 is a schematic of a network 10 with a plurality of virtual meeting attendees 12 connected thereto. The network 10 may be any suitable interconnection for communicating data between the conference rooms 12, with examples including a digital data network, the PSTN, a wireless network, and the like. A preferred network 10 for practicing the invention includes a digital network configured for carrying packet-based data, such as an internet protocol network. These particular networks are believed to show great promise for carrying real-time video conferences with a high quality of service, at a reasonable cost, and in a highly immersive environment that is rich in data sharing.

Each of the attendees 12 are connected by a communications connection 14 to an interface 16 that is also connected to the network 10. The communications connection 14 may be a wire, a wireless connection, or other like linkage suitable for carrying communications such as packet-based digital data. The term "interface" as used herein is intended to be broadly interpreted as meaning a link useful to connect the different attendees. The interface 16 may be, for example, one or more of a bridge, a network card, a computer server or router, a software switch, a port, or the like. An exemplary interface 16 comprises a bridge having a plurality of ports.

In an exemplary method of the invention, the attendees 12 are conference rooms equipped to provide an electronic interface between individuals participating in the meeting and other individuals participating in the meeting that are not physically present in the same conference room. It will be appreciated that the attendees 12 may be embodied in many other forms in

addition to the conference rooms 12. For example, other attendees may not be conference rooms at all, but may instead be individual attendees at individual computers, or may even be individuals using data sending and receiving devices other than computers. Example devices include mobile electronic devices such as phones, personal digital assistants, and the like. Accordingly, the term "attendee" as used herein is intended to be broadly interpreted as meaning a human and/or electronic participant in a virtual meeting.

FIG. 2 is a schematic illustration of one exemplary conference room 12. It generally includes a plurality of cameras 20 and a plurality of microphones 22. The cameras 20 and the microphones 22 may be trained on a speaker 24, an audience 26, a data presentation 28, and the like. The cameras 20 and microphones 22 are linked to a computer 30 which may include a coder module for encoding the signals of the cameras 20 and the microphones 22. The computer 30 is also useful for communicating the encoded real time data streams from the cameras 20 and microphones 22 to the network 10 over the linkage 14. Other real time data streams may also be communicated to the network 10 by the computer 30, such as pre-recorded events, shared documents, and the like.

The computer 30 also receives communications from the network 10 over the linkage 14. The received communications can include real time video and audio data streams from the other conference rooms 12, as well as other data such as application data, replayed video, graphics and the like. The computer 32 may include a decoder for decoding received signals. The audio streams may be played over speakers 32, and video streams sent to one or more projectors 34 for displaying images 36 from the other conference rooms 12 on a screen 38. The images 36 displayed on the screen 38 may include the speakers, audiences, documents, recorded video, and the like received from other of the conference rooms 12. An operator may select which images 36 to show, as well as select how to position and size them on the screen 38.

Depending on factors such as the number of conference rooms 12 participating in the virtual meeting, and the number of cameras 20 and microphones 22 at each, a large number of images 36 and audio streams may be present. For convenience the audio streams from all of the conference rooms 12 may be bundled into a single stream so that all speakers and audiences can be heard simultaneously over the speakers 32. In this manner, a rich and immersive virtual meeting may be conducted in which many participants may hear, see and interact with one another in real time despite the fact that they are not physically present with one another.

It will be appreciated that the configuration of conference room 12 as illustrated in FIG. 2 is exemplary only, and that many other configurations are possible. Those skilled in the art will appreciate that the particular configuration may be established as will be useful for a particular application. More or fewer cameras and microphones could be present, for example. Also, the projector 32 and screen 36 could be replaced by one or more monitors.

Through an embodiment of the present invention, a primary data stream may be designated from those being communicated. This may be useful to provide some structure and organization to a virtual meeting that might otherwise become disorganized or even chaotic. For example, one video data stream showing one particular speaker may be designated as "primary," with all other attendee conference rooms 12 then displaying that stream on their screens 38 in a highlighted manner. A particular position and size may be reserved, for instance, for the display 36 that has been designated as "primary." This allows for all of the many individuals attendant at each of the conference rooms 12 to experience the conference with a degree of consistency and focus.

FIG. 3 is a flowchart of one exemplary method of the invention for communicating a primary data stream. Each of the conference rooms 12 communicate a plurality of real time data streams to all of the other conference rooms 12 across the network 10 (block 102). The plurality of real time data streams may include data streams from each of the cameras 20, microphones 22, replayed stored audio/video data, application data streams, and the like. Examples of real-time application data streams are a Word document, an Excel spreadsheet, a drawing, other application document that is being shared and collaborated on in real-time in a virtual meeting, real-time output from a modeling or other program, and the like. In cases of document-based data such as a spreadsheet, the document may be communicated continuously so that changes are seen in real-time by all attendees.

Each of the real time data streams communicated from each of the attendees preferably includes an identifier. The term "identifier" as used herein in this context is intended to be broadly interpreted as referring to a label, code, name, or other data that identifies a data stream. For example, an identifier may be header data communicated with packets of a packet based data stream that identifies the source and/or the content of the data stream (e.g., user 2332, camera 1).

A primary selection command is then communicated that identifies one or more of the plurality of data streams as the "primary" stream (block 104). The command preferably includes the identifier of the desired data stream(s). The primary selection command may be generated from one of the conference rooms 12, or from another source connected to the network 10. For example, a meeting facilitator may decide which stream to designate as primary. As used herein, the term "facilitator" is intended to be broadly interpreted as a person or computer program used to manage the virtual meeting, but not to participate in the meeting as an attendee. For example, a facilitator may be an individual using a computer connected to the network to view and listen to all of the streams being communicated between the attendees, but that does not communicate a video or audio stream to all of the

attendees. The stream may be identified by such a facilitator, by an operator of the computer 30 at one of the conference rooms 12, or by another that uses a selector such as a keyboard or mouse controller to select one stream displayed on a screen, and entering a selection command such as a keystroke or button-click.

More than one stream can be designated primary, and more than one primary selection command can be communicated. For example, each conference room 12 may communicate a primary selection command that designates one of the streams being generated from it as primary. As a result, each conference room would be communicating one primary data stream, and all conference rooms 12 will receive one primary stream from each of the other rooms 12. By way of additional example, a second primary selection command from a second source may be used to change an existing primary stream designated by a first source. By way of still further example, a primary selection command might designate a plurality of streams in a priority ranking.

One or more rules may be enforced to control designation of primary streams. For example, a rule may be enforced that designates from where and when a primary stream selection command can be communicated. Only a facilitator, only a particular conference room, or similar source may be designated as the only sources from which commands can be issued. Or, a rule may call for a virtual control "token" to be passed, with the "token holder" the only attendee allowed to issue a primary selection command. The token might be passed by request, or according to a pre-set schedule that allowed all of the attendees, for instance, to hold the token for a 3 min. period. Other rules may designate how many streams can be designated as primary at a given time, which streams can be primary, and the like.

The primary selection command(s) when received by the conference rooms 12 is used to identify the primary stream (block 106). For example, the primary stream identifier may be extracted from the selection command and stored in a memory accessible to the computer 30. The computer 30 may then monitor incoming data stream traffic and compare the

identifiers for all of the streams to the stored primary identifier until the primary stream is identified.

Once identified, the computer 30 outputs the primary data stream in a highlighted manner. The terms "highlights" and "highlighted" as used herein in this context are intended to broadly refer to treating with a higher priority than others. For example, the primary data stream may be a video data stream, in which case highlighting can include displaying in a larger display image 36 (FIG. 2) than other streams, in a designated "primary" display position on the screen 38 (FIG. 2), or using similar enhanced visuals. This highlighting helps to signify to viewers that the stream is the "primary" stream. FIG. 4 shows an exemplary display template that features the primary video data stream in a larger size than the other streams, in a designated placement upper left hand location, and with a "Primary" label.

Those skilled in the art will appreciate that the exemplary embodiments described and discussed herein are exemplary only, and that the invention is not limited to these embodiments. For example, although embodiments of the invention have been illustrated in the context of a virtual meeting, it may be practiced in other real-time data stream sharing environments as well. By way of additional example, although embodiments have been illustrated with particular numbers of meeting attendees and data streams, it will be appreciated that the method of the invention may be practiced on any practical scale. Invention methods and program products may be practiced, for example, with virtual meetings that include tens, hundreds, or more conference rooms and/or attendees, and with real time data streams that far outnumber the one illustrated herein.

Also, it will be appreciated that although exemplary method and program products have been illustrated in a particular sequence of steps, the sequence is not necessarily important to the invention and could easily be altered. Those skilled in the art will also appreciate that a computer program product of the invention may be practiced using one computer, or may be practiced using a plurality of computers that are connected by a data network,

with some method steps performed by a first computer and other steps performed by a second, connected computer.